

WOMBAT FOREST ESTATE

“A rural subdivision case study”

By
John S. Duff
Conservation Officer

January 1980
SOIL CONSERVATION AUTHORITY
378 Cotham Road, Kew, Victoria 3101

TABLE OF CONTENTS

| | |
|---|----|
| SUMMARY | 4 |
| INTRODUCTION | 4 |
| BACKGROUND | 6 |
| METHOD | 8 |
| RESULTS | 10 |
| (I) GRAZING..... | 10 |
| (II) TREE PLANTING..... | 10 |
| (III) CLEARING..... | 10 |
| (IV) HOUSING..... | 10 |
| (V) DAMS..... | 11 |
| (V) TRACKS..... | 11 |
| (VI) SOIL EROSION..... | 12 |
| DISCUSSION OF THE STUDY RESULTS | 12 |
| SUMMARY OF DISCUSSION | 16 |
| CONCLUSION | 16 |
| REFERENCES | 17 |
| APPENDIX 1 – TABLE 1 – DEVELOPMENT FACTORS | 18 |
| APPENDIX 2 – TABLE 2 | 20 |

LIST OF FIGURES

| | |
|--|----|
| WOMBAT FOREST ESTATE – GREENDALE – MAP 1 – PLAN OF ALLOTMENTS..... | 5 |
| WOMBAT FOREST ESTATE – GREENDALE – MAP 2 – GEOLOGY | 7 |
| WOMBAT FOREST ESTATE – GREENDALE – MAP 3 – TOPOGRAPHY | 7 |
| GRAPH 1 - % OF LOTS EXHIBITING EACH LAND USE AND MANAGEMENT TECHNIQUE (LUMT) RECORDED SEPTEMBER 1978..... | 9 |
| GRAPH 2 – RATE OF IMPLEMENTATION OF EACH LUMT | 10 |

LIST OF PLATES

| | |
|---|----|
| PLATE 1 – EARTHWORKS ASSOCIATED WITH HOUSE CONSTRUCTION | 11 |
| PLATE 2 – THIS HOBBY FARMER’S ATTEMPT AT DAM BUILDING MAY LEAD TO EROSION | 11 |
| PLATE 3 – LANDSLIP – BLOCK 127..... | 12 |
| PLATE 4 – REGENERATION OF NATIVE TREES AFTER FENCING STOCK OUT OF THE AREA | 12 |
| PLATE 5 – TREE PLANTING IS A COMMON PRACTICE | 13 |
| PLATE 6 – STEEP SLOPES AND ROCKY SOILS RESULT IN FEW GOOD DAM SITES..... | 13 |
| PLATE 7 – SEDIMENT IN THE GULLY FLOOR FROM A FAILED DAM. THIS WILL REDUCE THE CAPACITY OF THE DAM FURTHER DOWN THE DRAINAGE LINE | 14 |

| | |
|---|----|
| PLATE 8 – ROAD SURFACE EROSION – SHUTER AVENUE | 14 |
| PLATE 9 – TABLE DRAIN EROSION – SHUTER AVENUE | 15 |
| PLATE 10 – THE TOP OF A 5 M DEEP BULLY HEAD ON LOT 127 IS BELOW THE WELL GRASSED DAM BANK. | 15 |
| PLATE 11 – THIS BLOCK IS RECOVERING FROM HEAVY GRAZING DURING THE PREVIOUS YEAR. NOTE THAT THE UNPALATABLE TUSSOCK GRASS (POA AUSTRALIS) REMAINS..... | 16 |

SUMMARY

Recordings were made on the management techniques and land use undertaken by owners of small rural holdings, of approximately 1 to 5 hectares in size, from a 130 lot sub-division near Bacchus March Victoria. Observations of any soil erosion or environmental changes were also made.

The investigation was carried out over a three-year period. The aims were to:

- (a) Establish a factual base to allow more accurate predictions of the likely land use practiced on proposed rural sub-divisions with small lot sizes.
- (b) Obtain information on the environmental changes to an area following sub-division.

It was found that the blocks were being built on at the rate of 7% per year; that fencing to keep stock out of a block and thereby prevent grazing was five times more popular than fencing to permit grazing; fencing also permitted many landholders to plant significant numbers of trees and for existing timber to regenerate. The landholders regarded water supply as important, as witness the many new dams.

Existing erosion was re-activated and new sources of silt, such as roads, tracks, table drains and failed dams have appeared

INTRODUCTION

Soil Conservation Authority officers have a particular interest in and are often asked to comment on proposed rural subdivisions. They comment in the light of their experience in soil conservation and erosion. They also inspect proposals for sub-division in which individual lot owners will need to provide stock and domestic water supplies from on-site sources.

An important planning guideline for proposed rural sub-division is the Land Use and Management Techniques (LUMT) that may be used by the future lot owners. LUMTs have very direct effects on the ecology of the block and surroundings, therefore soil conservationists are extremely interested in LUMT.

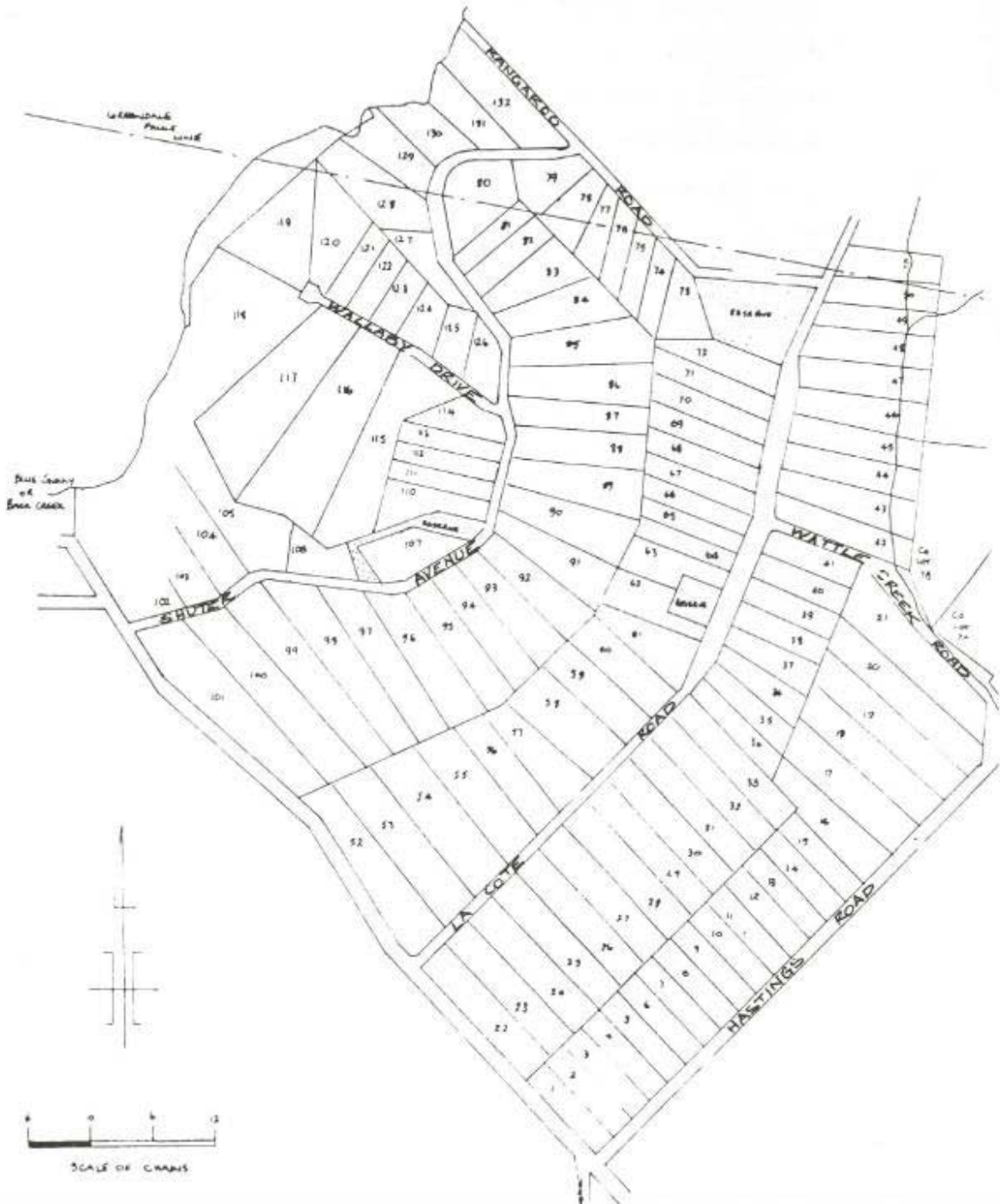
This study is intended to establish a more factual base on which planners can made predictions on how rural sub-division lots are likely to be used y their future owners. In the past, such planning has mostly been based on impressions and experience, without recorded evidence to back it up.

A sub-division near Bacchus Marsh, Victoria, the Wombat Forest Estate, was chosen for the study. It has a large number of blocks, a variety of geological land types, varying landforms and relatively uniform block sizes of between one and five hectares.

It is well recognised that land use on subdivisions can, to some extent, be pre-determined at the planning stages by varying lot size. For example, the owners of a 40 ha lot would probably be more interested in cropping or grazing. On the other hand, the owner of a 1 ha lot may have no greater interest than establishing a large garden.

The results of this case study therefore should be confined to use for sub-divisions with small size lots, namely 1 to 5 ha.

Wombat Forest Estate – Greendale – Map 1 – Plan of allotments



BACKGROUND

(i) **Location:** The Wombat Forest Estate sub-division is located near Greendale in the shire of Ballan, Parish of Blackwood and is in the Catchment of Pykes Creek Reservoir.

(ii) **History:** The sub-division was originally surveyed in 1969, with most blocks being sold in 1972. Prices ranges from \$2,000 for a 0.8 ha block to \$6,000 for a 5.2 ha block

CAs 7B, & and 17 were sold as intact blocks. CAs 1, 2, 3, 4, 5, 6, 6A, 7, 11, 11A and 12, all of Section 8, Parish of Blackwood, were divided into 130 lots ranging from 0.8 ha to 5.2 ha in area. The total area is 256 ha. Average size of blocks (excluding 7B, 7A and 17) is 1.6 ha (Map 1).

(iii) **Geology:** The geology is complex. The Western half is a Permian fluvio-glacial bedded sandstones, conglomerates and glacial tillites. The Greendale fault separates the Permian material from the northern section of Ordovician sandstones and quartzite. The Ordovician material extends around the eastern boundary to enclose a section of Pliocene sands, clays and gravels (Map 2).

(iv) **Topography:** The section west of Lacote Ave. has slopes from 5%-30% towards Back Creek. The southerly facing Greendale fault escarpment has slopes of 20-30% (Map 3).

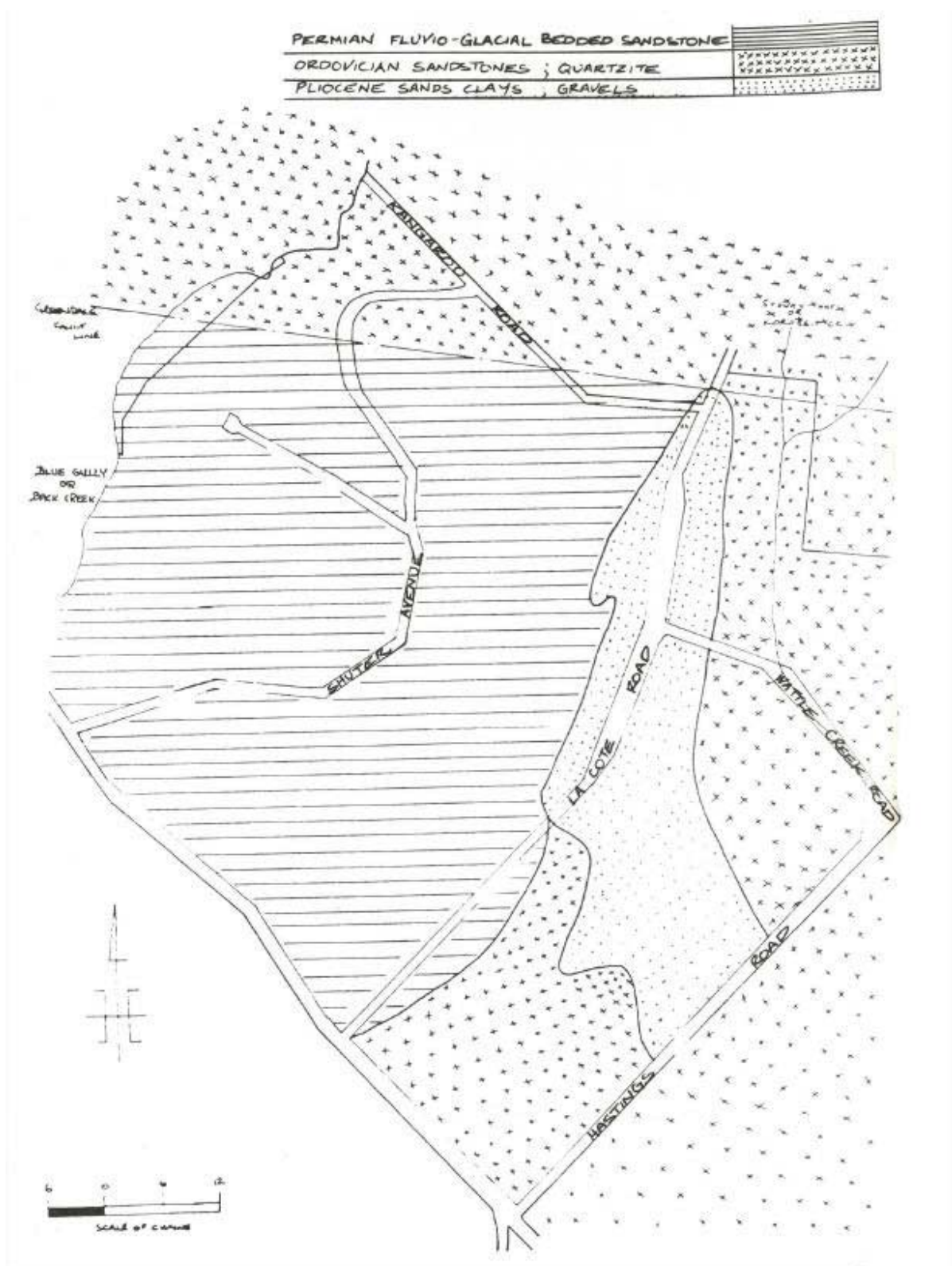
A flatter central-eastern section based on Pliocene sediments exists. The north-eastern Ordovician slopes range up to 20% in slope.

The western section is drained by Back Creek while Stoney Creek drains the eastern side of the sub-division.

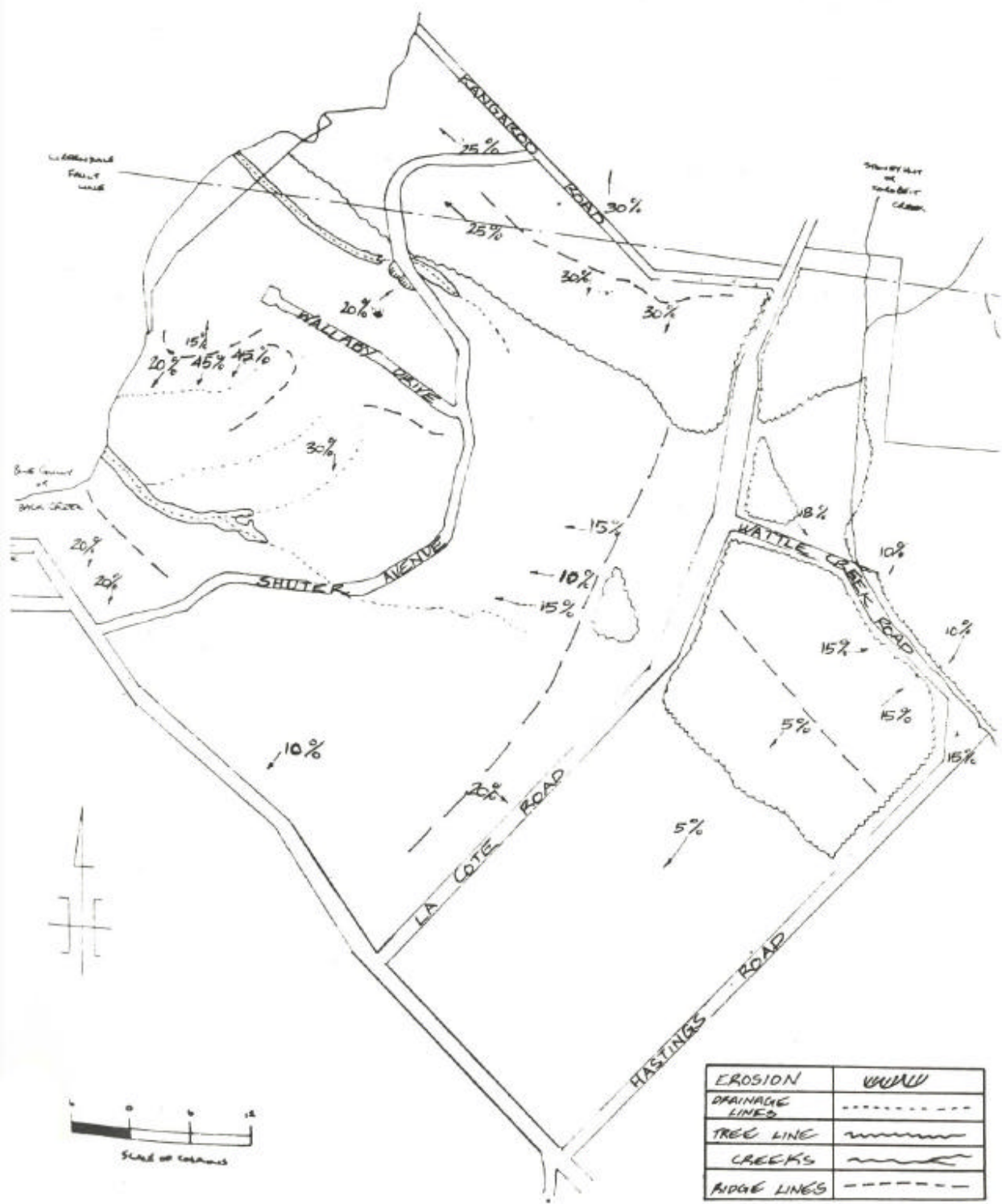
(v) **Soils:** The soils are generally podsollic in nature. The soil of Permian derivation is shallow on the ridges, 0-30 cm in depth, but deeper in the drainage lines 2m+. The soil formed on the Ordovician sediments is skeletal. Soil formed on the Pliocene sediments is podsollic and reasonably deep and sand on the ridges.

(vi) **Vegetation:** The natural climax species are red stringybark (*Eucalyptus macrorhyncha*), manna gum (*E. viminalis*) and Silver wattle (*Acacia dealbata*). Bracken (*Culcita aubia*) and native grasses persists on the slopes and in the drainage lines. The northern Ordovician section has no ground cover except for forest litter. No areas have been pasture-improved by the new owners.

Wombat Forest Estate – Greendale – Map 2 – Geology



Wombat Forest Estate – Greendale – Map 3 – Topography



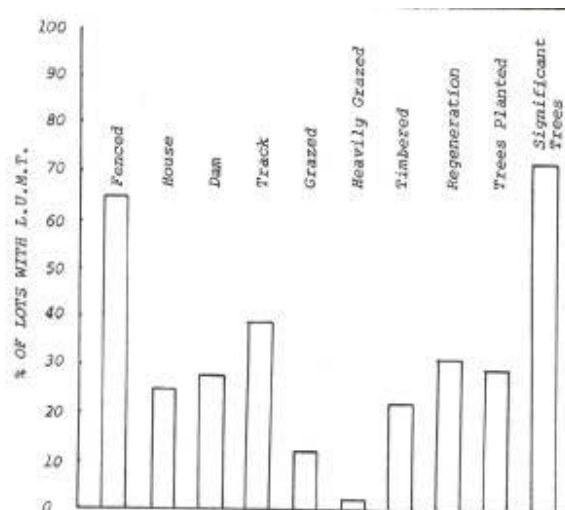
METHOD

Information on each lot was collected on four different occasions over a three year period. Collection dates were September 1975, October 1976, November 1977 and September 1978.

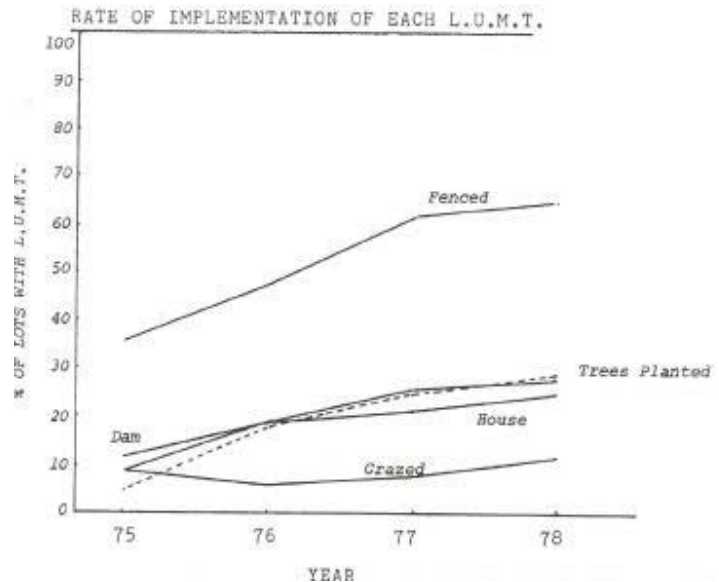
Observations as recorded are listed in Appendix 1 and were based on the following criteria:

| | |
|-----------------------|---|
| <u>No development</u> | No observable movements |
| <u>Fencing</u> | New stock proof fencing erected |
| <u>House</u> | Self-contained dwelling |
| <u>Dam</u> | Earthen water storage |
| <u>Failed Dam</u> | Breached dam |
| <u>Grazed</u> | Presence of stock |
| <u>Heavily Grazed</u> | Short pasture |
| <u>Overgrazed</u> | Very short pasture together with bare patches and indication of hand feeding |
| <u>Tracks</u> | More than 30 metres of track constructed and often gravelled |
| <u>Clearing</u> | Clearing during survey other than for a house site |
| <u>Trees</u> | More than 20 trees planted |
| <u>Timbered</u> | 90% of the block is covered in thick naturally occurring trees |
| <u>Regeneration</u> | Regrowth of native trees |
| <u>Trees Growing</u> | A combination of lots with either regeneration, natural timber or planted trees |
| <u>Lots for Sale</u> | Allotments exhibiting For Sale sign |
| <u>Erosion</u> | Mentioned in results but no measurements taken |

Graph 1 - % of Lots exhibiting each Land Use and Management Technique (LUMT) recorded September 1978



Graph 2 – Rate of implementation of each LUMT



RESULTS

Detailed results are contained in Table 1 and 2 in the Appendix. Graphs 1 and 2 summarise the significant results. Each major Land Use – Management Technique (LUMT) encountered is discussed briefly under its own heading, together with photographic evidence taken on 12/7/78. The implications of each LUMT are explored in the discussion.

(i) Grazing

Grazing occurred on 9% of the blocks in 1975, dropped to 6% and 8% in the following years but rose again to 12% in 1978.

(ii) Tree Planting

A most encouraging action taken by the landholders was the planting of trees. Twenty-five percent of the landholders had planted significant numbers, in many cases in excess of 100 trees. Twenty-three percent of the blocks are still naturally timbered therefore planted trees now feature on one-third of the previously cleared blocks.

Regeneration of native species is occurring on the fenced, ungrazed blocks. As 51% of the blocks fall into this category, regeneration is highly significant.

(iii) Clearing

Since the area was subdivided clearing has been restricted to house sites only except for one block.

(iv) Housing

The number of houses existing on the estate has nearly tripled in three years. Thirty-two houses now exist. If building continues at this rate the area will be fully settled by 1990.

Evidence of roof runoff and sillage being the direct cause of erosion and/or pollution was not found.



Plate 1 – Earthworks associated with house construction

(v) Dams

Twenty-four percent of the blocks have small earthen dams of 200 – 800 m³ capacity. One-third of these have either been poorly constructed or have required excavation above full supply level, both of which can lead to soil erosion.

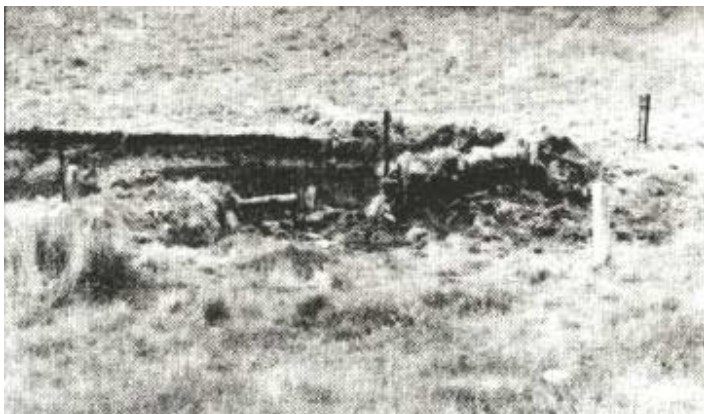


Plate 2 – This hobby farmer's attempt at dam building may lead to erosion

Up to 50% of blocks will have problems catching enough water for a dam. For example, Blocks 42-51 could each have a dam on the one drainage line all “tip-to-toe”. The Shire of Ballan has considered imposing on “eight foot” maximum height limit for any dam bank on the sub-division.

(v) Tracks

Thirty-seven percent of the blocks have tracks. Average track length is approximately 100 m, giving a total of 5 km over the sub-division. Average width is 3 m, representing a hard-surfaced area of 1,500 m² (1.5 ha). If all blocks eventually have tracks, the area of hard surfacing will total 4 ha. If roads and roofs are added to this figure, hard surfacing could total about 5% of the sub-division area.

Three tracks, representing 8% of the total track length, had table drain erosion.

On most blocks it would be possible to construct a track for permanent all weather access to half of the block. The exceptions being Block 80 and Blocks 129-132 on the Ordovician section. Block 80 already has a track with a 25% slope which is subject to serious sheet erosion and is not trafficable by two wheel drive vehicles all year.

(vi) Soil Erosion

Erosion had occurred on the estate prior to sub-division. Gully head occurred on Block 127 and on the Reserve area west of Shuter Avenue.

Table drain erosion has occurred along section of Shuter Avenue and Kangaroo Road. Road surface erosion has occurred on Shuter Avenue in the vicinity of Blocks 82-87.

A small landslip (10 m long, 2 m high) occurred on Block 127 (Plate 3). In the same locality, dam seepage on Block 80 has initiated slumping of the road batter.



Plate 3 – Landslip – Block 127

DISCUSSION OF THE STUDY RESULTS

The study results show some definite trends. The main land uses, in order of popularity, were “ungrazed parkland”, tree planting, housing and grazing. The main management techniques practiced on the estate, in order of incidence, were fencing, track construction and dam building.

Discussion here examines the importance of each of these LUMTs in relation to each other, then attempts to formulate a description for average management on 1-5 ha lots.

A fence is generally the first activity occurring on a lot. It permits animals to be kept in or out. The results in this study showed that fencing intended to keep animals out was at least five times more important than that intended to keep them in.



Plate 4 – Regeneration of native trees after fencing stock out of the area

Keeping stock out has encouraged regrowth of timber (Plate 4), allowed trees to be planted without expensive guards, prevented damage to existing trees and fostered the growth of other vegetation. The extra trees will directly benefit soil conservation, as in the future they will transpire large quantities of water thereby reducing runoff and infiltration, subsequently avoiding erosion and soil salting.



Plate 5 – Tree planting is a common practice

From the conservation point of view, another pleasing result of the survey is the number of lots on which people are planting trees (Plate 5). The number and different varieties of trees being planted is also pleasing. When the number of blocks already timbered, and the number being allowed to regenerate, is added to those being planted with trees, it is evident that at least 80% of the sub-division will probably present a “parkland setting” in 10 years time. The amount of tree planting on surrounding farm land is negligible.

Water supply is obviously important to lot owners, as 36 dams have been constructed. Many of the dams were less than 500 m³ in capacity.

Many small lot owners who contact the Soil Conservation Authority for advice require enough water for 0.2 ha of garden/lawn, five people and two horses. The ideal dam size for these requirements in this area is approximately 940 m³, based on 4% runoff and a storage period of 18 months. The catchment area needed is approximately 2.1 ha. On this sub-division, 47 lots must accept a lower standard of water use due to insufficient catchment. Blocks 73-80 and 130-132, because of the rocky soil and steep slopes have no suitable sites at all (Plate 6).



Plate 6 – Steep slopes and rocky soils result in few good dam sites

Several lot owners appear to have been misguided with dam construction, many of which area of poor construction. Plates 7, 8, 9 and 10 illustrate the point. So far, only one of these dams (Plate 7) has actually failed and caused sedimentation. However, others could fail.



Plate 7 – Sediment in the gully floor from a failed dam. This will reduce the capacity of the dam further down the drainage line

It appears that most lot owners would be far better off if a reticulated water supply could be made available to this sub-division. The high fire risk would also be eased by a reticulated water supply.

Soil erosion on the sub-division is not a serious problem. However, road surface, table drain and drainage line erosion, does exist.

Road surface erosion has occurred on Shuter Avenue (plate 8) and the northern end of Hastings Road. Road surface erosion is often masked due to maintenance and replacement of gravel although it is still a significant contributor of sediment to streams and eventually, in this case, to Pykes Creek Reservoir. Track erosion occurred on 8% of tracks and is a similar problem to road surface erosion.



Plate 8 – Road surface erosion – Shuter Avenue

Erosion in the table drains is present and will become worse as more blocks are developed. (plate 9). Hard surfacing, associated with tracks, buildings, clearing and overgrazing, increases runoff to table drains. In this sub-division, the effects of these factors could be tripled if all blocks are developed. By using half-round “armco” farming on one side of Shuter Avenue, most of the table drain erosion could have been avoided on the sub-division.



Plate 9 – Table drain erosion – Shuter Avenue



Plate 10 – The top of a 5 m deep bully head on Lot 127 is below the well grassed dam bank

A major planning criticism of this sub-division is associated with the problem of the two gully heads on two blocks (Plate 10). These areas could have been declared reserve areas, as was done for the Reserve west of Shuter Avenue, and erosion control works carried out. The owners of both blocks appear to be reluctant or unable to cope with these problems, which will eventually threaten Shuter Avenue and the blocks above Block 83 if left untreated. Both these gully heads, as well as the head in the Reserve west of Shuter Avenue, showed signs of re-activation.

No evidence of re-activation of erosion on the surrounding farm land was found.

Another planning criticism is the release of lots north of the Greendale Fault line. Blocks 129-132, 73-76 and 80 have steep slopes greater than 25% and therefore have no house, dam or track sites. Blocks 77-79 have no dam sites. If these lots did not exist, there would be no need for Kangaroo Road and the northern part of Shuter Avenue, in both of which table drains are eroding.

Grazing is not a popular land use in the Wombat Forest Estate. In only four cases out of thirty did permanent residents have stock, indicating that, at present, permanent residents are more interested in rural “hideaways” rather than hobby farms. Some of the other lots that were grazed may have been leased to local farmers as several blocks were grazed as one.

Overgrazing and heavy grazing occurred mainly in the first year of the study (1975), following a dry autumn and winter. Some of the surrounding farm land was also over-grazed in that year but not to the same extent as that which occurred on the estate.

The overgrazing/heavy grazing possibly indicates the lack of flexibility of grazing management, the lack of understanding of the all-year carrying capacity of the land the absentee management of the block owners. None of the lots was overgrazed or heavily grazed on more than one survey date, indicating that perhaps the owners are learning from experience.



Plate 11 – This block is recovering from heavy grazing during the previous year. Note that the unpalatable tussock grass (*Poa australis*) remains

From this survey it would appear that grazing of small rural lots is not a great threat to soil conservation. It might also be deduced that any council or statutory body wishing to limit grazing on blocks of this size may have the majority of residents on their side.

SUMMARY OF DISCUSSION

1. Average management of small rural lots, 1-5 ha in size, in the case of this subdivision involves:
 - Fencing to keep stock out
 - A house
 - A track
 - A dam
 - Tree planting
2. The management of most of the landholders is leading to a “parkland setting” due to tree planing, regeneration of and preservation of existing timber.
3. From a soil and water conservation viewpoint, the main problems of the subdivison are:
 - Lack of adequate water catchment and storage potential of each lot
 - Road side erosion
 - Road surface erosion
 - Re-activation of existing erosion
 - Unsuitability of northern Ordovician area to development
 - Lack of landholder’s “rural” knowledge
 - Track erosion

CONCLUSION

The findings of this survey indicate that most owners of small lots of 1 to 5 ha are interested in parkland retreats. Sub-divisions with lots size of 1 to 5 hectares would appear to be commensurate with soil conservation, providing roadsides are protected from erosion, that a reticulated water supply is provided, that erosion control measures are made the responsibility of the sub-dividers, that more attention is paid to

land capability and some provision is made for flood retention of runoff originating on the sub-division. Education of lot owners in all aspects of rural management is also very necessary.

The method used in this study is a simple way of observing and measuring the effects of rural sub-division. Further observations on the Wombat Forest Estate at a suggested interval of five years could be worthwhile.

REFERENCES

McHarg. I. L. "Design with Nature", 1971 Double Day/Natural History Press

APPENDIX 1 – TABLE 1 – DEVELOPMENT FACTORS

| Development Type | Sept 75 | | Oct 76 | | Nov 77 | | Sept 88 | |
|--------------------------------|---------|------|--------|------|--------|------|---------|------|
| | No. | % | No. | % | No. | % | No. | % |
| No development | 48 | (37) | 45 | (35) | 27 | (21) | 25 | (19) |
| Fenced only | 12 | (9) | 17 | (13) | 23 | (18) | 25 | (18) |
| Fenced and developed no houses | 19 | (15) | 23 | (18) | 31 | (24) | 31 | (24) |
| Fenced | 47 | (36) | 62 | (48) | 80 | (62) | 84 | (65) |
| House | 12 | (9) | 24 | (19) | 33 | (25) | 36 | (28) |
| Dams (new) | 15 | (12) | 9 | (7) | 9 | (7) | 3 | (2) |
| Dams (total) | 15 | (11) | 24 | (19) | 33 | (25) | 36 | (28) |
| Dams (failed) | 0 | (0) | 0 | (0) | 0 | (0) | 1 | (1) |
| Blocks grazed | 12 | (9) | 8 | (6) | 10 | (8) | 16 | (12) |
| Overgrazed | 1 | (1) | 0 | (0) | 0 | (0) | 0 | (0) |
| Heavily grazed | 6 | (5) | 1 | (1) | 3 | (2) | 3 | (2) |
| Tracks | 21 | (16) | 47 | (36) | 49 | (38) | 50 | (39) |
| Trees (planted) | 7 | (5) | 23 | (18) | 33 | (25) | 38 | (29) |
| Cleared in year | 0 | (0) | 1 | (1) | 0 | (0) | 0 | (0) |

| Development Type | Sept 75 | | Oct 76 | | Nov 77 | | Sept 88 | |
|--|---------|------|--------|------|--------|------|---------|------|
| | No. | % | No. | % | No. | % | No. | % |
| Timbered (thick semi natural forest) | 30 | (23) | 29 | (22) | 29 | (22) | 29 | (22) |
| House and dam on one site | | | | | 16 | (12) | 18 | (15) |
| House and tree planting on one lot | | | | | 15 | (12) | 17 | (13) |
| House and grazing animals on one lot | | | | | 4 | (3) | 5 | (4) |
| Regeneration (On lots not timbered) | | | | | 18 | (14) | 40 | (31) |
| No. of lots on which trees are growing | | | | | | | 93 | (72) |
| No. of lots for Sale | 10 | (8) | 6 | (5) | 5 | (8) | 17 | (13) |

APPENDIX 2 – TABLE 2

| | | |
|--|----|-------|
| Number of lots grazed at each and every survey date | 1 | (1%) |
| Number of lots grazed for 3 out of 4 survey dates | 4 | (3%) |
| Number of lots grazed for 2 out of 4 survey dates | 12 | (9%) |
| Number of lots with not enough catchment for 0.2 ha of garden, 4 people and 2 horses | 47 | (36%) |